Mercury Impacts

from an

Electric Arc Furnace Steel Mill

***MacSteel*, Jackson, Michigan**

Model Used:

Industrial Risk Assessment Protocol for Human Health (IRAP-h)

Michael Depa

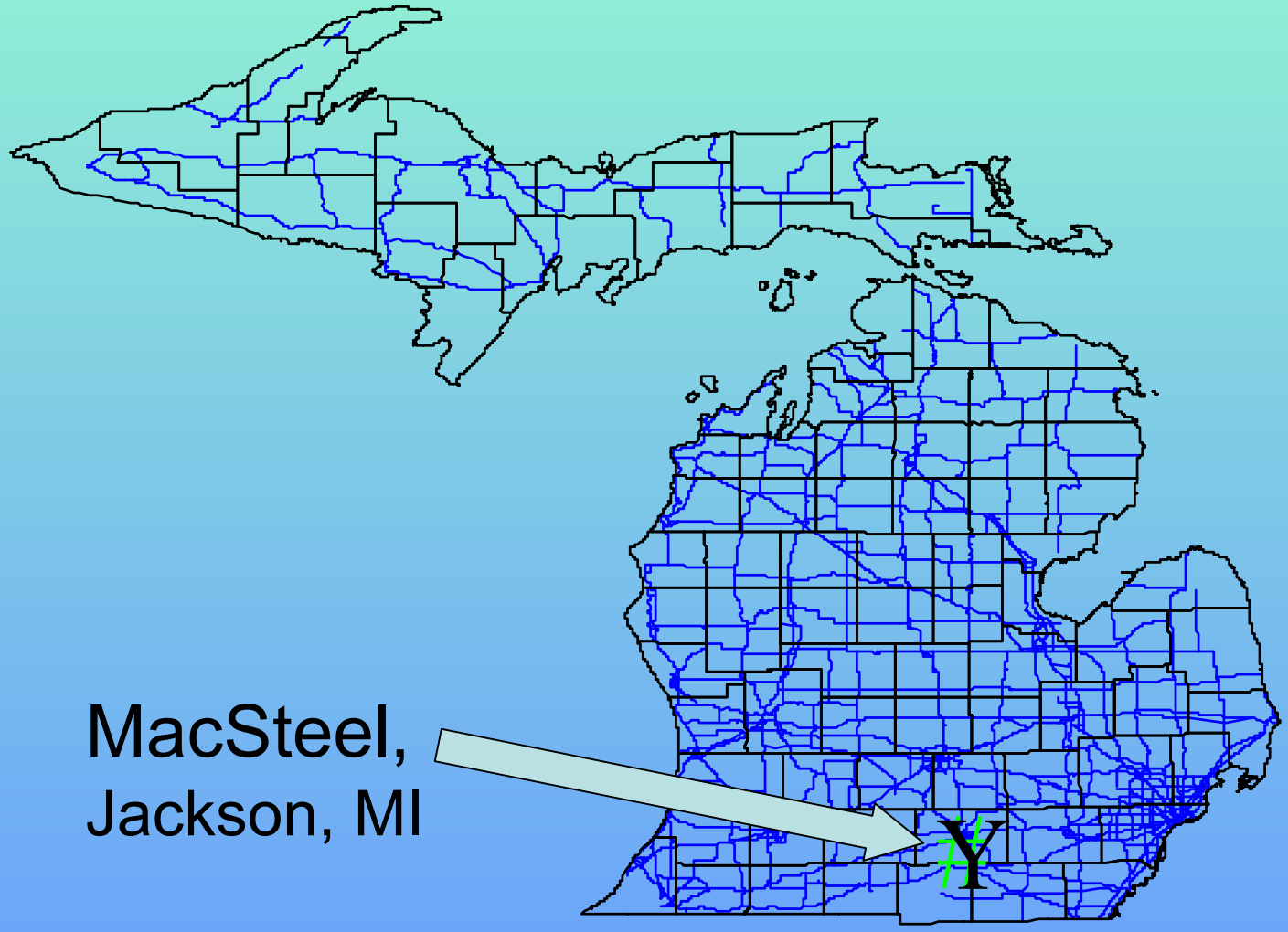
Michigan Department of Environmental Quality
Air Quality Division
Toxics Unit

MacSteel

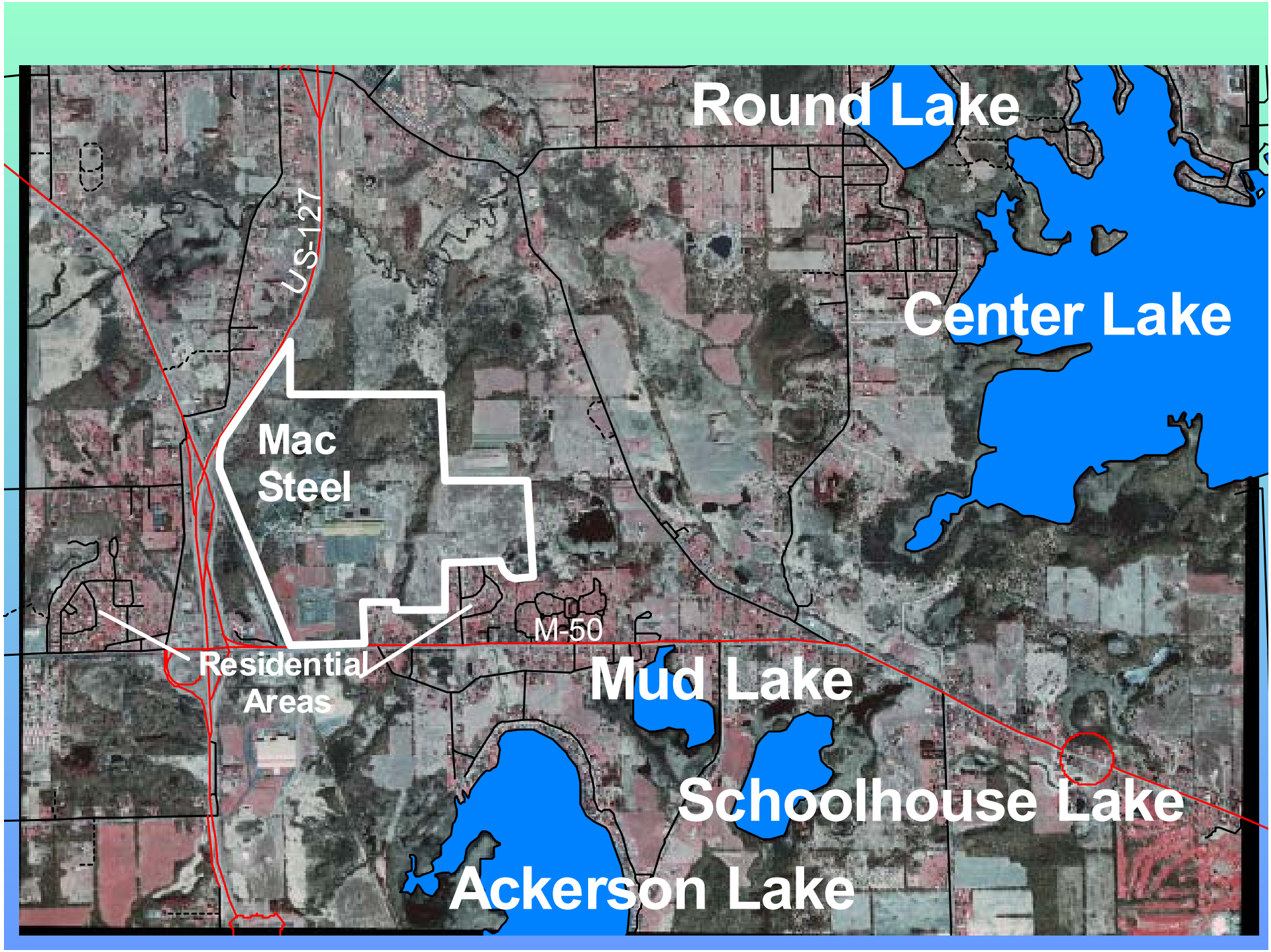
- **Specialty Steel Bars for Auto Industry**
  (350,000 Tons/Yr)
- **2 Electric Arc Furnaces**
- **Melts Scrap Metal (shredded automobiles, etc.)**
- **Bag House:** Fabric Filter (lime coated)
- **Emissions:** 138 Pounds of Mercury/yr
- **Elevated Methyl Mercury in Nearby Lakes:**

  Avg. Fish Tissue Conc. of Methyl Mercury = 0.2 – 0.5 mg/kg
  Michigan Fish Advisory Trigger Level = 0.5 mg/kg
  RfD for Methyl Mercury = 0.0001 mg/kg

Location of MacSteel



MacSteel,
Jackson, MI


Round Lake
US-127
Center Lake
Mac
Steel
M-50
Residential
Areas
Mud Lake
Schoolhouse Lake
Ackerson Lake

Model

Software:

Industrial Risk Assessment Program for Human Health (IRAP-h View)

by Lakes Environmental

Based on the US EPA's Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities

Dispersion Modeling

- ISCST3: Conc., plus Wet and Dry Deposition
- 1-hour and Annual impacts for:
  - Vapor
  - Particle
  - Particle Bound
- 10 km grid

IRAP Inputs

- ISCST3 Plot files (n=6)
- Spatial Locations of Rivers and Lakes and their Watersheds (+ areas drained by lake) 17 Lakes, 1 River

  Digitizing the shapes of lakes and drainage areas is time intensive.
- Site Specific Parameters

  Average Evapotranspiration (evaporation + transpiration)

  Annual Irrigation (with soil depth, Z)

  Annual Precipitation

  Annual Runoff

  Wind Velocity

Input Parameters

continued

- Lake Depth and Volumetric Flow Rate
- Erosivity of Soil
- Fish Consumption for adults and children
  (Michigan Specific)
- Methyl Mercury Bioaccumulation Factor (BAF)
  (Michigan Specific = 113,096) EPA's= 6,800,000
- MacSteel is expected to operate for 30 yrs
  EPA's default = 100 yrs
- Cover Management Factor…and many more…
  Chris Lambesis of EPA Region 5 helped a lot with input parameters

IRAP Outputs

- Water Concentrations
  - Mercury, Mercuric Chloride and Methyl Mercury
- Fish Concentrations
- Risk (Hazard Index)
  - Adults = 0.17
  - Children = 0.11

Conclusion

- Excellent Risk Tool, but…
- Extremely Resource Intensive